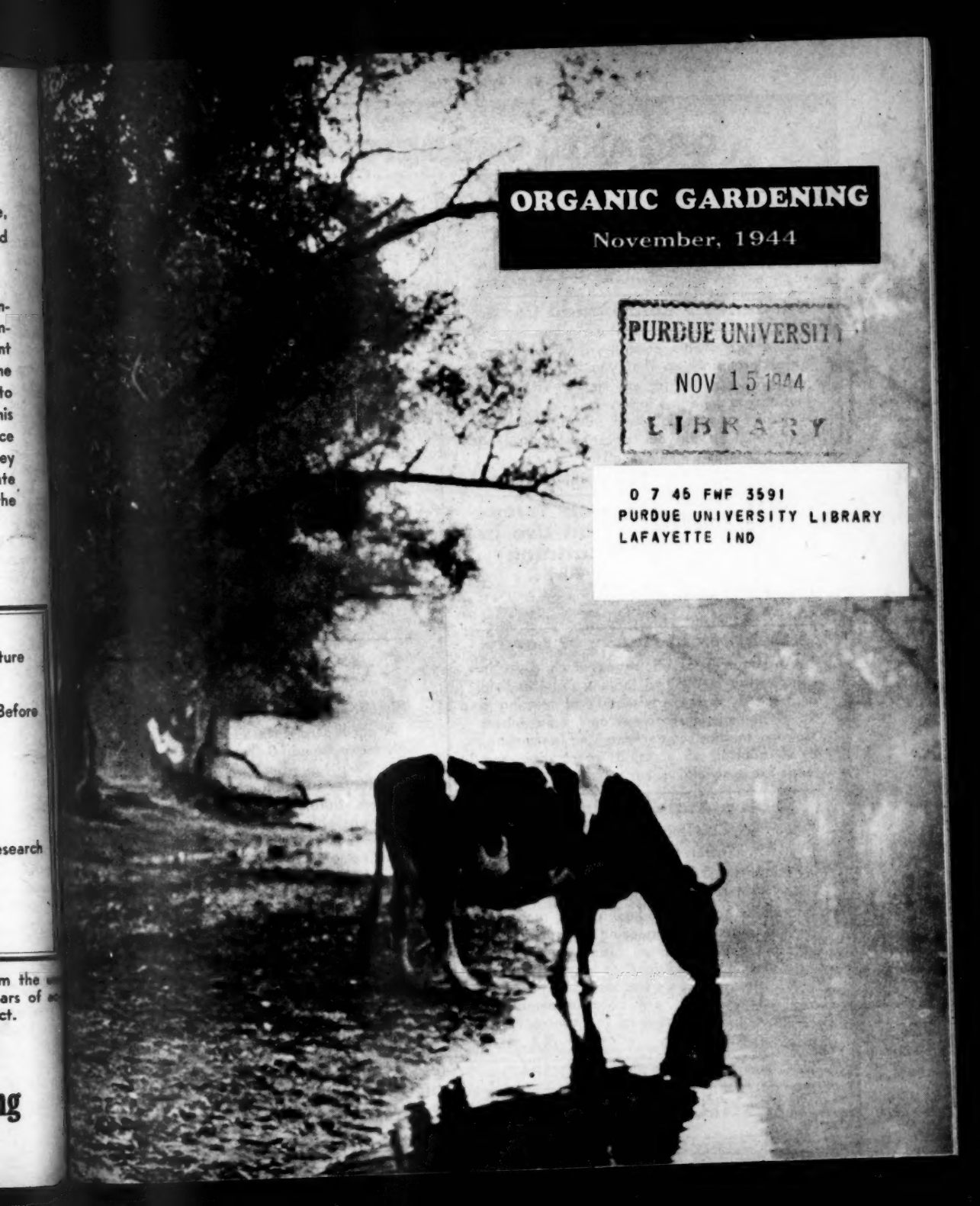
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J. I. Rodale, Editor — Sir Albert Howard, C.I.E., M.A., Associate Editor

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With The Editor

Is Our Health Related To The Soil?

THE following is a statement by a writer in a recent issue of a well-known health magazine:

"America is the most hospitalized, served by more physicians per capita, spends more money for medical attention, uses more drugs, has the finest battery of medical scientists working in the most elaborately-equipped laboratories endowed by the greatest wealth, in the most magnificent educational and research centers found anywhere, and yet—it is the sickest nation in all the world. Where lies the trouble? Why do draft boards find more ill health in the present war crisis than was discovered during the last World War? Why the pathetic state of health found among children which are attending our daily public schools?"

A past-president of the American Dental Association, Dr. Arthur Hastings Merritt, recently said that tooth decay today, even though a wonderful system of dental care has been worked out, is as bad as it was 100 years ago. This is so in spite of so-called correct diets, with the generous inclusion of orange juice and other so-called vitamin-rich foods.

Newsweek of July 24, 1944 said:

National Health: Shocking

"A nation which had boasted of its living standard, diet, homes, schools, hospitals, medical care, sanitation, recreation, and health last week heard some shocking statistics on its physical condition:

"More than 4,000,000—one third—of its young draftees were rejected as physically or mentally unfit.

"Nearly every American (95 per cent) needs some dental care; 30 per cent need it badly."

Take the Canadian situation. The No. 2 issue of "The Land" for 1944 says, "Dr. Albrecht's paper on Calcium, in the previous issue of "The Land", (p. 50), was

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of amazing interest to Canadians. A recent survey by the Canadian Council of Nutrition shows that 60 per cent of Canadians suffered an 80 per cent of calcium deficiency. In this list the deficiency of calcium came second; vitamin B being 90 per cent. Proteins showed a deficiency of 72 per cent. From the content of Dr. Albrecht's discussion the high deficiencies of both calcium and the proteins suggest a more than ordinary significance."

The general public is lulled into a false sense of security by the longevity statistics. According to the figures the average length of life in 1942 was about 64 years. In 1900 it was 50 years. According to this it would appear that our health is improving remarkably. But when the situation is carefully studied it will be seen that there are conditions; ifs, ands and buts.

Louis I. Dublin, head statistician for the Metropolitan Life Insurance Co., in an article in the Reader's Digest says that in 1850 the average length of life was 40 years. "Then came the modern sanitary era. Advances in public health curbed the terrible inroads of cholera, diphtheria, tuberculosis and typhoid, and set up systems of protection over water and milk supplies. As a result, the expectation of life in the United States by 1900 had advanced to about 50 years. The 14 years added since that date are the result of an intensive application of our knowledge of disease prevention, and a general and profound improvement in the standard of living."

There are many other factors, in addition to those mentioned by Mr. Dublin, for the present higher longevity figures. Infant mortality has been tremendously reduced in the past 20 years (from 86 to 40 per 1000). We have better plumbing, sanitation and water supplies. There are no more black deaths due to unsanitary conditions to bring the longevity figures down. We have a better conception of the value of a rounded out diet. Years ago the menu was bread, meat and potatoes. People used to die of starvation. We have a sufficiency of food today. Pauperization, with its attendant health hazards is being wiped out.

We have better surgery procedures in hospitals. To go to a hospital for an operation 50 years ago was a sure invitation to the graveyard. Those were the days of the crudest forms of surgery and blood-letting. The public today is being properly educated in preventive medicine. It is taught not to take a laxative when there are pains suspiciously indicative of appendix trouble. There has been a great reduction of fatalities from ruptured appendixes as a result.

But let us break-down the longevity situation into its various elements. Such diseases as smallpox, diphtheria and typhoid have been practically e l i m i n a t e d. Deaths from pneumonia have been greatly reduced due to the sulfa drugs. But the degenerative diseases cancer and heart disease are increasing alarmingly. Heart disease has increased about 60% and cancer 90% in the last forty years. Diseases such as infantile paralysis are increasing from year to year. There are new diseases never heard of before. In February of 1944, a Gallup survey showed that 23,000,000 persons had colds. Bear in mind also that with increasing skill doctors have learned to keep unhealthy people alive.

Dr. Alexis Carrel has recognized the problem when he said, "All diseases of bacterial origin have decreased in a striking manner. . . . . But we still must die in a much larger proportion from degenerative diseases. In spite of the triumphs of medical science, the problem of disease is far from solved. Modern man is delicate, 1,100,000 persons have to attend the medical needs of 120,000,000 other persons. Every year, of this population of the United States, there are about 100,000,000 illnesses, serious or slight. In the hospitals, 700,000 beds are occupied every day of the year. . . . . Medical care under all its forms, costs about $3,500,000,000 (billions) yearly. . . . . The organism seems to have become more susceptible to degenerative diseases."

A very important statement about the general health of the country, longevity statistics notwithstanding, was editorialized in "Dental Items of Interest" (1942) by its editor Paul H. Belding, D.D.S. He said, "The state of health of the American people is something of which we should all be ashamed, and to say that this or that condition is responsible for so many rejections falls in the same category as the blind man's description of the elephant.

"If we look at the health problem of the nation from its broad aspects, we find that every day one in twenty of our people is too sick to perform his regular occupation. The average citizen suffers ten days of incapacity annually. The average child is sick in bed seven days of the year, the average oldster 35.

"Every day 6,000,000 individuals are sick and 42% of them are suffering from so called degenerative diseases. Degenerative diseases include the chronic slow-working diseases, the exact cause of which is unknown at the present time, such as hypertension, coronary disease, rheumatism, appendicitis, gall stones, cancer, peptic ulcers, acne, diabetes, nervous diseases, and la

but not least, dental disease.

"The evidence is conclusive, that as a nation we are on the down hill trail that leads to an inferior race. This information is not new to those who have seriously interested themselves in the problem."

General health statistics are more important than that of longevity. In 1938 Lord Lymington wrote, "workers insured under the National Health Insurance Act lost on an average 28 days of work a year through illness, compared with about 16 days of work 15 years ago."

The real fact of the matter is that when you study into the longevity figures you find that the benefits accrue to a great extent to the low age groups. After you eliminate infant deaths, diseases of childhood and after you adjust the figures for deaths due to pestilences, etc., your chances of living after you reach the age of 35 is just about the same today as it was 100 years ago. Look at some of the figures of Revolutionary war days! Benjamin Franklin lived to be 84, Jefferson 76, John Adams 91, John Quincy Adams 81, Washington 67, Madison 85, Monroe 73, Morris 72, etc.

The general health of the public and the longevity statistics are two separate and distinct things. Dr. Russell Wilder of the U. S. Dept. of Agriculture said, "Longevity in the United States has almost doubled since 1882. The services of public health have every reason to be proud of this achievement although it also must be recognized that extending length of life does not alone imply creating a more healthy life."

Health does not merely mean the absence of disease. Real health is a positive condition of unbounded energy and feeling and the crystal clear functioning of the mind along with the utmost optimism and cheerfulness of manner and kindliness of character. How many people fulfill all these requirements? How many people ever get a feeling of *euphoria?* What is *euphoria?* The dictionary says it's a sense of well-being and buoyancy. Its a feeling you get when you are hitting on all eight cylinders and purring all over.

The medical profession will cure your disease sometimes, but will that cure produce bounding health? Usually not. It merely neutralizes a negative condition without restoring a real positive one. Prevention is more important than cure. Cures are being developed to a high degree of perfection but a poor body "cured" does not compare with a healthy body that does not get sick.

The attitude of the medical profession is not very encouraging. When the Senate appointed a subcommittee to study the underlying reasons for the draftees' poor health showing, Dr. Thomas Parran, Surgeon General of the United States Public Health Service suggested as a remedy that the Government spend about two billion dollars for a new state-hospital system. That is the typical way of a physician. If the two billion dollars instead were spent to place humus in the soil of our farms we would then have a positive approach to the problem. That would be something basic, instead of the negative approach of building more hospitals merely to cure disease.

There is sufficient proof to show that the status of our health is directly related to the condition of the soil in which we raise our foods. Alexis Carrel, in his world-famous book *Man the Unknown* realized the vicious part that chemical fertilizers play in reducing the nutritional value of our foods when he said, "Chemical fertilizers, by increasing the abundance of crops without replacing the exhausted elements of the soils, have contributed indirectly to change the nutritive value of our cereal grains and our vegetables."

This problem is recognized by Russell M. Wilder, M.D. of the U. S. Dept. of Agriculture who in an article in the April, 1943 issue of *The Scientific Monthly* (Quality of the Food Supply and the Need for its Control), said, "The soil is poor in certain regions and the products of such soil fail to contain some nutrients that ought to be contained in them. This at present is a major topic of investigation of the Agricultural Research Administration. The chemists will in time be able to correct such abnormalities of the soil. The aim of agriculture until now has been at maximal yields per acre or at size and appearance of the product. The aim in the future should be set at high nutritional values. . . . Experiments performed under my direction confirm the views of many others that the present food supply is most unsatisfactory." There are interesting facts in this statement. First Mr. Wilder is a physician. Secondly he is employed by the U. S. Dept. of Agriculture. Third, he says that there are many others who are dissatisfied with our present food supply. Fourth, and a very disappointing fourth, is the fact that he says chemists will be the ones to correct these abnormalities in the soil. He should have said *biologists,* instead. he chemists have had their chance and failed dismally.

Dr. Charles E. Holzer, a Gallipolis, Ohio surgeon, and one-time president of the Friends of the Land, at the first annual meeting of that organization stated that "in gashed-up south-

ern Ohio, there was a connection between thinned soils, floods, and washed out people with poor bones, thin blood and no vigor."

Dr. L. A. Maynard, Director of the Cornell School of Nutrition recently stated, "It is interesting that with the recognition of the need for 'protective foods' measures were taken to increase yields and 'market quality'; vegetables and fruits were bred for drought resistance, cold and disease resistance, etc., but in all of this development little attention has been paid to the real reason why these foods are needed in the diet—their content of nutrients which make them protective."

Another bit of evidence showing how farming and our health is directly related is the "heart chart" issued by the Heart Association of America. It shows unmistakably that deaths from heart disease are increasing alarmingly in those states that have been farmed the longest. In those states the land has been mined. Valuable soil nutrients are removed in the crops which cannot be replaced by chemicals. Valuable mineral elements which ought to be present in our foods are therefore absent. Only the application of humus, limestone, phosphate rocks and other such mild ingredients can replace these lost elements.

One of the readers of Organic Gardening, C. H. Lane of Eureka, Kansas, writes, "In my youth, my folks moved to Kansas where the country was just being settled. All food products were grown on virgin soil. People were strong and healthy, except for cases of malaria and a few typhoid. There was but little sickness. Folks did not know much about sanitation, but lived naturally, no hospitals and no doctors. Large families were the rule. No one ever officiated at births other than one of the neighbors wives. No canned, pickled, denatured, or chemically preserved foods. No white flour. Only whole grain corn and wheat, ground without processing, plenty of vegetables, wild game of many kinds, and later an abundance of home sun dried applies for winter use. No insects ever bothered apples, peaches and pears, spraying fruit trees was unknown, no worms or bugs bothered them.

"The growers of foods are woefully ignorant of necessity to produce highly mineralized and vitamin foods. Most soils are badly depleted. Some use commercial fertilizers which produce mushroom growth, but are deficient in many elements."

Jonathan Forman, M.D., editor of the Ohio State Medical Journal (April, 1944 issue) echoes the general medical acceptance of food as a factor in health when he says, "Medical research made one of its greatest contributions to human welfare when it began to dig up positive evidence that improper food and a consequent bad state of nutrition was the underlying cause of many diseases. Not only were organic diseases so identified, but bad nutrition was found to interfere with the proper working of the bodies of both man and the animals."

But the public will not gain optimum health thru nutrition, by buying vitamin pills. Rather than spending the reputed $200,000,000 annually for these pills, if the money were used to make humus and given free of charge to our farmers, the individual will gain far more in health and well-being.

That the vitamin content of our food is dependant on the quality of the soil which mothered it has already been proven by several experiments. In 1926 the famous McCarrison in experiments with grain at Madras India, discovered that if grown organically it would contain more vitamins. This is summarized in the Journal of Indian Medical Research (14:351, 1926) as follows, "In Madras, McCarrison found that grain produced with farmyard manures contained more vitamins than that grown with minerals."

A most convincing experiment was carried out by M. J. Rowlands and Barbara Wilkinson which was written up in the Biochemical Journal (Vol. 24. No. 1. 1930). The article states in part, "This research was undertaken because one of us (M. J. R.) had noticed that pigs which were fed on home grown and home ground barley and wheat always did much better than those pigs which were fed on purchased barley and wheat, and that certain cattle did better on certain fields. It was decided to find out whether this was due to the lack of lime or of other mineral constituents of the land. The results of this investigation were not satisfactory. It was then decided to try the effect of artificial manure versus dung."

A crop of clover and grass was grown, one-half fertilized with dung, the other half with chemical fertilizers including basic slag, kainit and sulphate of ammonia. Then rats were tested by feeding them the product of these fields—"the rats were divided into two lots; one lot was put on a deficiency diet to which was added 20% of the "dung" seed, the other on deficiency diet with 20% of the "artificial" seed. . . The rats on the "dung" seed showed good growth or a slight subnormal growth. . . . The rats on the "artificial" seeds all grew very poorly, not one giving normal growth. . . . It can be seen that the former have gained nea

ly twice as much as the latter. . . The rats on the "artificial" seed were in a poor condition; in some the hair was falling out."

To my mind the most important benefit of eating organically grown foods is their effect in improving our minds and our spirits. What good is a strong body if our minds are poor and our spirits low? Buckle, in his *History of Civilization* states, "It is proved by history, and especially by statistics, that human actions are governed by laws as fixed and regular as those which rule in the physical world. . . . . Climate, soil, food, and the aspects of Nature are the principal causes of intellectual progress." How well said! Soil and food and our intellect are more closely related than most people think.

Mental disorders are terribly on the increase. The National Committee for Mental Hygiene is at its wit's end trying to find the cause and methods to heal this serious type of sickness. They have found that mental disturbances "fill more hospital beds in this country than all other disabling diseases combined and that there is a great and ever-growing demand for hospital and clinic accommodations for the care and treatment of sufferers from mental and nervous disorders." They suggest mainly psychiatric research as a preventive measure. The real answer is in the soil. This is a dangerous situation as the Draft Board figures show. There isn't much time left to dabble.

Laird, in *The Tail that Wags the Nation,* says, "The country's average level of general ability sinks lower with each generation. Should the ballot be restricted to citizens able to take care of themselves? One in four cannot. . . . . The tail is now wagging Washington and Wall Street and LaSalle Street. . . . . Each generation has seen some lowering of the American average of general ability.

"Although we might cite any one of nearly two dozen states, we will first mention Vermont by name because that is the place studied by the late Dr. Pearce Bailey. 'It would be,' he wrote, 'safe to assume that there are at least 30 defectives per 1000 in Vermont of the eight-year old mentality type, and 300 per 1000 of backward or retarded persons, persons of distinctly inferior intelligence. In other words, nearly one-third of the whole population of that state is of a type to require some supervision."

Vermont is one of the states that have been farmed the longest. It has a coarse, stony soil that makes farming a job that takes a lot of doing.

Roger Babson, the financial wizard, mentioned the connection between soil and mind in one of his recent syndicated news columns. He said, "Why have the best brains grown in certain valleys of New England, New York State, Pennsylvania and Virginia? The answer is that the soils of these valleys—washed down during the centuries from rocky hills—contain the needed minerals to make the best brains. I have especially in mind potassium, phosphorus, iron, iodine, calcium and magnesium. If you doubt me, ask the publishers of "Who's Who" to give you their opinion on this subject.

"This third factor of the mineral content of the soil, including the treatment of the soil, is now very seldom discussed. The Department of Agriculture has avoided reporting on it because it is a "hot potato loaded with dynamite." However, it is of prime importance to every family planning to live on the products of its own land."

In the same column he discusses a startling situation with regard to the Prussians. He says, "Some years ago when I was in Switzerland making a study for the New York Times, a Swiss scientist said to me; 'Europe will always have trouble with those Prussians. There is something in the soil of Prussia which grows people with that fighting instinct. European peace is unalterably linked up with the minerals of the soil. Permanent peace in Europe will come about only by systematically moving people about. That is the only way physical, economic and spiritual opportunities can be equalized.' "

This definitely indicates a connection between the soil and the frame of one's mind, but in the case of Prussia it may have some connection between their kind of soil and the overuse of chemical fertilizers.

The famous physician, William Howard Hay, M.D., the originator of the well-known Hay Diet, recognized the importance of food to the brain. He said, "only when the brain is competently nourished can it be as alert as it is supposed to be. . . . When muscle breaks down fuels to furnish energy, these fuels, during oxidation, leave behind an acid ash; and if the blood is already well saturated with this sort of debris it is not nascent, not able readily to take up this debris and remove it from the field of activity, and its accumulation there is the sole cause of muscular fatigue. It is even so with the brain; for if its activities must be supported by oxidative processes, then there must be left behind this acid ash, even as in muscular activity, and the circulation must be well freed habitually of this sort of material if it is able to take up quickly and transport to the lungs this acid debris for elimination, thus

keeping the field of activity clear, and so preventing the accumulation that spells fatigue.

"So it is not difficult to see the connection between foods and mental activity; for even as the body is fatigueless if not intoxicated, just so is the brain, and clear thinking depends far more on the right foods eaten in the right way than people dream of in the average philosophy.

"It has been said on good authority that we are far more inefficient mentally than physically. Physically we are estimated to be less than half as efficient as we should be or as we easily can be, and mentally the percentage of efficiency on the average is supposed to be far lower than this."

Dr. Jonathan Forman, previously mentioned, said, "If we deprive our people of sound nutrition, we shall lose the type of world leadership necessary to rearrange this world so that an enlightened and happy republic can survive. For this, we must have the very best nutritional state in the bodies of every one of us."

In the 1939 U. S. Dept. of Agriculture yearbook called *Food and Life*, p. 30 appears the statement, "Pellagra is primarily a disease of ill-fed people. . . . . 400,000 cases annually have been reported in the United States; 10 per cent of the inmates of asylums in the South have been mentally affected as a result of pellagra." Pellagra is caused by eating a diet which lacks the necessary food elements. Such a diet is usually corn-pone, syrup and sowbelly, day in and day out. I mention this illustration to show that food and our mentality have a direct connection.

A physician told me of a group of U. S. Government convicts who were hardened criminals of a most vicious type. They were a problem, continually fighting and resorting to extreme violence. They were transferred to a new prison, somewhere in the South where they were put to work raising food on the prison farm. It was virgin land never before farmed. Soon the prisoners began to soften down and mellow. Fights became a rare occurrence. At last the men were about as gentle a group of prisoners to be found anywhere. The Government attributed this change to the eating of food raised on virgin soil, full of minerals. The doctor had read about this in a U. S. Dept. of Agriculture publication. To date I have not been able to track it down.

There is much basis for this transformation of character by a diet of food that comes from a healthy soil. The Hunzas of India who eat food raised with plenty of humus and rock minerals, have very gentle dispositions, fine characters and physical health. They are smart, good craftsmen and full of fun. They are much further ahead mentally and spiritually than neighboring peoples who are careless about their agriculture.

It would seem to me that if every bit of food-producing soil in this country were intensively treated in the organic manner, if its biologic life were kept at the highest practical levels, we could become a race of super-men and super-women. I hear someone say, "If that is so then why wasn't the whole world "super" in the days before chemical fertilizers were discovered? That's a good question and there's an answer to it. In those days there was a certain amount of ignorance in regard to general agricultural principles. While it was understood that stable manure was good for the land much farming was done with very little of it.

As you know, animal manure by itself is not a complete plant food. It requires the addition of green plant matter wastes such as weeds, leaves, etc. as is done in the Howard method of making compost. A lack of knowledge of the benefits of such composts led to a form of lazy husbandry with indifferent results. Ireland in the past has had famines and potato blights due to careless methods in their agriculture. In many cases manure has actually been used as a fuel. This is true today in many parts of India where much human illness abounds.

There have been in the days past problems of overpopulation, lack of rainfall, general ignorance and economics, that have militated against the production of the highest quality food. But we today have the benefit of science and a generally higher level of intelligence of the leaders, the men at the top. We can produce food such as never has come out of any soil, at any where, or any time. We now have the secret, a veritable fountain of youth and we must put it into practice.

You can do your daily dozen, you can eat a scientifically varied diet, you can refrain from smoking and adopt many other commendable health habits but you will not achieve the ultimate in the perfection of health until you demand food that is raised with organic fertilizers. We will all become better citizens and may have a world without wars or even labor and political strife.

It seems to be the fashion of the moment to formulate plans for what to do with Germany to prevent her from stirring up trouble in the future. Prevent her from using chemical fertilizers. See to it that their land is enriched with humus and perhaps the German war-like character may eventually change.

J. I. RODALE

Quality in Humus

By SIR ALBERT HOWARD, C.I.E.,

NOW that certain areas of the British Empire such as South Africa—Southern Rhodesia in particular—are becoming compost-minded and emerging from the thraldom so long imposed by the NPK mentality, the worship of the artificial manure bag, and the fear of the parasite, the next step in the campaign to establish organic farming and gardening must be considered. This is the supreme importance of quality in humus, which in turn depends on the care taken in the management of the compost heap or pit or in the skill shown in sheet composting. The object of this note is to emphasize the importance of quality in compost and to put forward a little of the supporting evidence already available, and also to suggest how more evidence can so easily be obtained. We need not wait for this additional support to be furnished by the experiment stations: it can be supplied by any observant farmer or gardener.

That quality in compost is important will be evident from the following examples:

1. In some experiments on young pigs, referred to in Lady Eve Balfour's *The Living Soil*, it was found that a turf, or fresh soil from molehills, taken from a field fertilized by properly made compost, invariably cured the disease of white scour when this item was added to the diet; on the other hand, turves or soil from land manured with artificials had no such effect. In both cases the turves or soil would contain humus, but only quality humus cured the trouble.

2. When the quality of the humus formed under the turf of meadows in Great Britain, which have been attacked by yellow rattle—a flowering parasite of the witchweed type—is improved by changing the meadow into a pasture when the droppings of live stock in the spring and early summer come in contact with the vegetable wastes, the grasses are stimulated by the high-quality humus so produced to such an extent that these flowering parasites are unable to attack and disappear of their own accord. The same sort of thing happens in the case of witchweed on maize in Rhodesia. Properly made humus removes the disease: humus of low quality has little or no effect.

3. When the results of farmyard manure—a good example of low quality humus—are compared ton for ton on all kinds of agricultural and garden crops with properly made Indore compost, the improvement due to the latter both as regards yield and quality must be seen to be believed.

4. When a complete artificial manure and an equivalent dressing of Indore compost are applied for a year or two to areas of grass land side by side, and the grazing animal is then allowed a free choice of the herbage, the preference of the live stock for the latter is most marked. The animals eat the plots which have received high-quality compost to the roots and only lightly pick over the areas murdered by artificials. In both cases humus is formed under the turf, but the quality is vastly different in the two cases.

What is the object of crop production? To feed live stock or mankind. As, in both cases, the quality of the produce is so important, it follows that in the agriculture of to-morrow mere yield will only become really significant when it includes quality. We must, therefore, in our future farming and gardening, strive first for quality, and then pay attention to the best way of getting the maximum yield which also includes quality.

Incidentally this intrusion of quality into crop production will automatically eliminate the statistician and sweep most, if not all, of the past results of our experiment stations first into the dustbin and then into the compost heap. The only service to agriculture, which the records of such experiments as those of the Broadbalk plots at Rothamsted (on which the artificial manure industry is based) can furnish, will be to augment a compost heap or to provide an example of what to avoid in our future experimental work. The statistician, whose food is always numbers, will soon vanish from the rural scene and retire to his study, for the simple reason that we cannot easily convert quality —the thing that really matters in farming—into the numbers on which he is nourished. Without a supply of new numbers the

statistician will, so to speak, starve to death.

How are we to make sure that our supplies of compost include this important factor of quality? By following the principles of Nature as seen in the wood. We must mix our vegetable and animal wastes in the correct proportions (some four to one), provide air, water, and a base, and so allow the moulds and microbes which make the humus to synthesize this product as quickly as possible. The importance of a base to neutralize acidity will be evident when the nitrogen balance-sheet of the perfect compost heap is drawn up. A good deal of nitrogen fixation by means of *Azotobacter* then takes place, when the ideal conditions for these organisms are provided. We must at all costs see to it that the putrefactive processes, which always lead to smells and attract flies, are never allowed to establish themselves in our compost heaps. If this should happen, we shall inevitably lose quality in the final product, which loss will be duly passed on to the crop, the animal, and to ourselves.

Composting Results

By MANUEL CALVO

I hope you will forgive me if I preface my experience with composting at greater length than need be but it pleases me to think that I was a compost gardener before Organic Gardening was thought of and all unbeknown to myself.

In the Fall of 1938 we rented a place with quite an expanse of waste land which later I learned had been an orchard. It was wild and rough looking. I measured a weed (giant ragweed) 15 feet and about 3 inches in diameter. But I wanted to make a garden, so I cleared the place as well as I could and started to break ground. It was impossible; those sods would not break and the ground was like a rock. Being an Austrian, which means very obstinate, I did not give up. It occurred to me that if I covered the ground with the trash I had just removed and left it there over winter it might be softer in the Spring, so I brought the trash back and with some more that I gathered spread it over to a depth of about three feet.

As I did not know a thing about gardening I proceeded next to read everything I could lay my hands on, on the subject. Among the things that fell into my hands was a gardener's account. He had spent 59 dollars and the produce at the market price was 17 dollars. Perhaps labor was included but the largest item as I remember it was for fertilizers. I was sure that was not my idea of fun. If anything would grow without fertilizers well and good; if not, well, seeds did not cost so much and my time was free. Add the Spaniard's innate suspicion of "artificials" and it will be readily seen that I would take to compost as a duck takes to water.

By mid April my three feet thick blanket of trash had flattened down to not over one foot, the sods were not there and the soil could be worked with a stick. I planted my things in the course of time and when they had made some growth I put the trash back between the rows and in a very short time it had vanished.

I never had reason to be ashamed of my corn but I never had corn like that since. The corn stocks were 14 inches higher than the height given in the description, not a few had three good ears and few had less than two; the same goes for everything I grew.

Early in 1941 we moved here. The ground was broken in a fashion but very rough and forbidding, heavy clay which stuck like glue and baked like a brick. Artificials were out of the question and manures were unobtainable so the only recourse left was compost and compost alone. Very unjudiciously I always grow more things than I have compost for, with the result that I have to spread compost very thin, so thin that it would not be an exaggeration to say that I spread it with a medicine dropper. Yet my things grow well. The effects must be commulative for my soil today is much darker, soft and crumbly. One can stick one's hand up to the elbow almost at any time.

A very experienced gardener has said of my tomato plants that they were the healthiest looking tomato plants he had ever seen. A friend of ours has persuaded her father to raise my "brand" of tomatoes from seed. Yet she is convinced her father's tomatoes do not taste like mine. I hear similar things of other things very often.

You can imagine my satisfaction when Organic Gardening fell into my hands and I realized I had been on the side of the angels from the very beginning.

Hints For The Victory Gardener

This is the twenty-fourth of a series of articles by this author dealing with the cultivation of ordinary vegetables.

By ROGER W. SMITH

BEETS AND SWISS CHARD

MORE than ever this season you will make room in your Victory garden for an ample crop of these valuable members of the beet family. You will have gone a long way in understanding how to produce fine beet crops if you think of the cultivated descendants of the wild *beta vulgaris* as mainly consisting of: the red garden beet root, the leaf beet or chard, the sugar beet, and the mangel-wurzel. Few wild plants have presented to mankind a more valuable progeny than the *beta vulgaris* commonly found growing in a wild state throughout a large part of Asia and North Africa.

It may well be that prehistoric civilizations at various times seized upon this wild plant and developed it in ways which we today do not fully understand and caused it to produce that kind of plant most necessary for their immediate needs. You will find that it will help you much if you intend to cultivate any of the beet forms to have a general understanding of the basic needs of the plant.

Beta vulgaris in the wild thrives in a rather damp soil plentifully supplied with calcium as a result of having a chalk or limestone subsoil. It resents sour soil. In its natural state it is a biennial with a life cycle of two years. The edible part of the plant is gathered during the first season either from the root or its leaves. If the plant is carried over during its second year it will flower, set its seeds, and die.

Red Beets. As you will easily understand certain fundamental conditions are necessary for success with red beets, if you desire them to form large, satisfactory roots. Like their ancestor the *beta vulgaris,* red beets are very sensitive to soil acidity, so much so that they are often used as indicators of acidity. Experienced gardeners know that if root beets thrive in a garden, the soil is not excessively acid and that other vegetables will also do well.

Naturally you will guard against sour soil. The best way to do this is to give the area a heavy application of crushed limestone the previous season. It is best to avoid the use of raw manure or other undecomposed materials. In the fall, the area should be well dug and allowed to stand during the winter in the rough.

Beets thrive in a soil which has been deeply dug and well pulverized and which is free from raw manure, raw lime, stones, and lumps. The soil should be "sweet" but not without its natural quota of mellow compost humus. Beets will do best in a well-drained, rather moist soil. A light sandy loam will produce an early crop but a rather heavy soil will often produce larger-rooted, later beets which are very valuable for storage. Heavy soils have a certain advantage over lighter ones but it is possible for beets to fail if the soil is excessively clayey. In this case it is possible for you to overcome this condition to some extent and to secure a good crop of roots by drawing the soil up into flat-topped ridges about a foot high and a foot wide across the top. Planting should then be done only along the tops of the ridges.

Beet seed as sold will offer you some difficulty. If you examine the seeds closely you will notice that each seed is really a tiny ball. These balls are actually dried flower parts, each ball containing from two to seven seeds held in a cluster. To improve germination the seed should be soaked overnight before using in a container in which has been placed a quantity of compost wa-

ter—water strained from a mixture of rainwater and mature compost humus.

As early in the spring as the ground can be worked it should be properly prepared and the area where the rows of red beets are to grow should be given a light top dressing of mature compost humus just before the drills are made. Beet seedlings are very delicate and have difficulty in breaking through any soil which has a tendency to cake although they seem to prefer a heavy loam where this condition is likely to occur. The shallow top dressing of compost humus will add to the soil fertility and prevent the possibility of losses through caking of the surface.

As evenly as possible the seed should be planted about fifteen seeds to the foot of row and immediately covered with about one half inch of sifted compost humus. Because beet seed is rather slow to germinate, it is a good plan to mark the rows. A very old method is to plant a radish seed every few feet along the row. The rapid growth of the radishes not only marks the row and makes early cultivation easier, they also help to break through any crust which might have formed.

But no matter how much care you take you will probably find it a bit difficult to secure an even stand of young beet plants because of the complex nature of the seed. So your first impression, when the seedlings finally show up, may be one of dismay. Heavy stands of plants may alternate with empty spaces. However, young beet plants are easily transplanted. In order to allow sufficient room in which to form fine roots, it is best when the plants are a few inches tall, to thin them so that they stand about three inches apart in the row. Seedlings removed during the thinning process may be used to fill gaps in the rows or to start new rows.

In the root forming beets you have a fine range of strains from which to choose. Early beets, which probably originated with the ancient Egyptians, mature in about fifty-six days. Late beets, which may well be planted to follow a very early spring crop, such strains as the Winter Keepers, require eighty days to reach maturity.

For a steady supply of very valuable nutritional beet greens, the seed should be planted rather thickly in the rows and the plants, when they are a few inches high, should be given a heavy mulching of mature compost humus. In harvesting beet greens the tops of the plants are usually cut off as needed as close to the ground as possible after the plants have attained seven or eight inches in height.

Late beets may be stored in the garden in a well drained, straw-lined trench about a foot in depth. After harvesting the roots, all imperfect or damaged specimens should be set aside for current use. The best roots should be placed carefully in the trench after their tops have been removed so that about an inch of the leaf stalks remain. Storage beets should be covered with several alternating layers of straw, or similar material, and top soil until a covering is built up through which deep frosts will not penetrate.

An ounce of seed is usually sufficient for one hundred feet of row, and one hundred feet of row will produce about eighty pounds of beet roots.

Chard or Swiss Chard: Closely related to the root beet, chard is popularly grown for its heavy and valuable leaf crop. This plant provides very large quantities of fresh edible "greens" of a type generally considered essential for proper health.

Chard will grow in any good garden soil in which lettuce thrives. It is not as sensitive to soil acidity as the red beet. If the soil in your garden is amply supplied with natural organic humus you should encounter little difficulty in growing a fine stand of this excellent food plant. Chard is a warm weather plant. It is often grown to replace the cool weather plant, spinach, during the heat of the summer.

A little experience will show you that an easy way to grow chard is to sow the seed thinly in shallow drills, each drill thirty inches apart, and to cover the seed with about one half inch of sifted compost humus. The seedlings should be thinned to stand about ten inches apart in the row.

Just as soon as the plants have developed considerable growth you will be able to harvest the outer leaves of each plant. This process is known as "stripping". If you do it carefully and avoid injuring the center bud, the plants will continue growing and producing new leaves. A short row should provide you with a very large amount of crisp, fresh, edible material until the arrival of frost.

During recent years several fine, broad-leaved, flat-ribbed, strains of chard have been introduced. To Lucullus, an old favorite, has been added many new strains the most spectacular, perhaps, is the Rhubarb Chard. In this strain the leaf stalk and the larger leaf veins are a delicate, translucent crimson. Here, of course, you will note a family likeness in the crimson of the stalks of the Rhubarb Chard and the crimson of the root in the red beet.

From leaf beet and chard, and

the delicate little red beet, you are likely to turn for a moment to the massive mangel-wurzels, the Golden Tankard, often weighing over ten pounds for each root, and the hugh, white-rooted Giant Half Sugar, the deep-rooted sugar beet. You will not wish to produce these enormous roots in the limited space of your Victory garden except as a curiosity but their formation will attract your attention, for they are all variations of the *beta vulgaris*.

Red beets and chard grown in healthy, well drained soil, are relatively free from plant disease or serious attack by insect pests. Scab, a condition often common with root crops, will not effect red beets when they are grown in normal humus but it is sometimes damaging if they are planted in poor soil which has recently been heavily limed.

The red beet, sometimes known as the garden beet, is a rather healthy plant. It has been very largely grown under garden conditions. It is fairly free from insect pests. Its close relative, the sugar beet, on the other hand is reported to be commonly subject to attack by one hundred and fifty different kinds of insect pests. You will wonder if the very wide commercial culture of the sugar beet, and the heavy use of artificials which so often accompanies such a culture, could be in some way responsible for this condition.

You may be interested in saving seed from some unusual beets you have grown. With members of the beet family this matter of saving seed is a fascinating but not always easy matter.

The selected roots should be topped without injury to the central bud and then stored overwinter, much as other root beets are stored. In the spring, the selected roots should be carefully replanted and encouraged into growth. Later, when the plants bolt, the tall seed stalks should be supported by stakes, and allowed to flower and produce their seed bearing branches.

But in any effort made to save the seed of members of the beet family you will bear in mind that the beet is our only important root vegetable which is wind-pollinated. Its pollen is carried by wind as well as by insects. Since red beets, mangel-wurzels, and other relatives readily cross, this matter of air born pollen may present many difficulties to you.

Beet pollen is so small and fine that samples have been collected by aviators at altitudes exceeding one thousand feet. Pollen originating in plants growing ten to twelve miles distant may find its way to the plants in your garden. Experiments have shown that in the brief uncovering of beet flowers necessary for hand pollination it was sometimes almost impossible to prevent contamination of the seed from foreign sources because of air born pollen.

So it is possible that air born pollen may cause the beet seed you obtain to be strangely crossed and your efforts may later result in a rather surprising group of hybrids of the red beet and some other member of this closely related family.

But the experiment will cost you little. From it you may learn much of the habits of growth of the descendants of that fine plant the *beta vulgaris*. And because of this understanding you will be that much better equipped to attack the important problem of growing other valuable plant forms which may provide essential and healthful food for yourself and your family.

Artificial Insemination of Cattle

Sir: I don't think we shall get anywhere if we argue about the supposed happiness or unhappiness of heifers who are artificially inseminated for that is not a subject upon which exact knowledge is possible for us to have. If I were in Mrs. Clay's position, and as fully persuaded as she is that only by this rather foul business could I build up a first-class milking herd, I suppose I should use it. I should argue that people are more important than cattle, and that the plentiful production of good milk is a good which outweighs the repulsiveness of this method of producing the necessary calves. But unlike her I should be miserable about it, and all the time I should have a feeling that this sort of thing would be certain somehow and some day to bring about some disconcerting and very nasty result.

Anyway, I am sure Mrs. Clay is wrong when she calls it a godsend. I simply don't believe that God sent it. I think it was much more likely one of these confounded scientists, from whose cleverness good Lord deliver us.

I am, etc.,

HUMANITARIAN.

From *Time and Tide* (*England*) June 3, 1944.

Lucerne (Alfalfa)

A New Food for Your Menu

By RONALD PHILLIPS

Reprinted from Health For All (England)

THE search for the perfect food is one that has baffled many seekers, and will continue to do so, since no single food is sufficient in itself. But there is one little known plant that comes so near to answering all nutritional requirements as to almost justify the title of the perfect food. This is the leguminous plant known to British farmers as lucerne, and to Americans as alfalfa. Orthodox opinion will place this deserving little plant into the watertight compartment known as "cattle food" and turn from it in distaste, but I believe, with the backing of Nature Cure and vegetarian experience, that it has a great future as human food.

I first made a study of lucerne from an agricultural standpoint. It is too little known to British farmers, especially outside East Anglia, but the list of its qualities seems never ending. Briefly, with a protein content higher than any other green food, with a well-balanced proportion of carbohydrates, it is almost complete in minerals and vitamins. Its roots penetrate to a depth of several feet, and in consequence the plant is drought-withstanding to an amazing degree, being fresh and green when grass and other crops are parched and yellow. This is not only a very valuable quality in our climate, but its continual greenness is an indication of its richness in that precious life-preserving substance, chlorophyll.

Three Crops Each Season

Once established, lucerne will yield three or four crops each season for about eight years. At the end of this period, when the crop is ploughed back into the land, it will return to soil an amount of nitrogen equal to one ton per acre of sulphate of ammonia, in the form of natural humus, which, of course, chemical fertilizers lack. A further advantage to farmers is that lucerne will yield crops four times as heavy as grass, in addition to its higher food value.

My thoughts tentatively turned towards the possibilities of lucerne as a human food. I had already studied the literature dealing with grass as human food, and made experiments myself, but rejected the idea on the grounds that the nutritional value of grass, combined with its unpalatable nature (to me) were not sufficiently attractive to warrant a change in food habit. Then one day I saw an item in a newspaper reporting that the Food Council of Australia (where the agricultural value of lucerne is fully recognized) were experimenting with dried lucerne in army rations. This gave me the signal to go ahead with my own experiments.

The young leaves of lucerne may be incorporated into a green salad with excellent results, the taste being not unlike that of watercress. For this use it is best to cut the plant when about three inches high, and after this stage the leaves should be picked off the stems, which grow tough and stringy. Owing to its "cut-and-come-again" nature, a small garden patch of lucerne will yield an almost daily supply throughout the summer. At the same stage of growth it is also possible to treat the plant in the same way as spinach, cooking it conservatively. The flavour is not unlike that of spinach, in a milder form, and even those who do not like spinach should not be prejudiced against it.

Drying Lucerne

The preparation of dried lucerne (and its use) take a little more trouble, but should appeal to those who are anxious to secure a good supply of vitamins in the winter. Sun drying is the only valuable method, and a hot, still, summer's day should be selected. The plants should be cut just when the small purple flowers are about to open, and put out to dry in full sun on paper or clean sacking. The south side of a wall makes a useful sun-trap. Best results are secured when the plants are frequently turned over, at least once every hour, if possible. When properly dried, it should be possible to rub the plants by hand into a powder or fine meal. This should be stored in a dry place

The dried lucerne is tasteless and may be incorporated into croquettes or any nut rissole or savoury mixture. It may also be added to soups, stews and milk drinks. Incidentally, there is no finer food for poultry than lucerne meal, and those who are partial to eggs may prefer to get the benefits of it "second hand" by feeding it to their hens.

I have mentioned that a small garden patch of lucerne is a good idea, and a few cultivation hints may not be out of the way. A little more attention is required at first than for most crops, but, as mentioned, once you have got it established you have a crop that should last eight years and improve your soil at the same time.

Cultivation Hints

Lucerne will not thrive in acid soil and likes plenty of lime. It gives you back some of this in the form of valuable calcium. The land should be as clean as possible, and kept well hoed, since nothing kills the crop quicker than weeds, particularly common grass. In order that you can keep it clean it is best to drill the crop in rows, one foot apart. It may be sown any time during the summer, but the best time is April or May. Too many cuts should not be taken during the first year, and it is often not fully established until a year after sowing.

Lichens on Rocks Form New Forests

General Electric Co. News Bureau

LICHENS, those leafy growths appearing on tree trunks and bare stones, initiate the formation of soil for new forest lands, Dr. Josiah L. Lowe of Syracuse, N. Y., assistant professor of botany at the New York State College of Forestry, declared in a General Electric Science Forum address here.

"No other biological agency can begin to accumulate soil over rock, and allow Mother Earth to cover the raw scars left by flood, fire or wind," he pointed out. "Though slow, the process is steady, and fire-blackened areas or bare rocks slowly but inevitably take on a sightly and protective cover of green.

"Lichens are biological curiosities, because they are not one but two plants—two unrelated forms of plant life that have entered into a partnership to form a characteristic vegetative structure that can endure conditions which either, alone, could not survive.

"One of the partners is an alga, a very simple kind of microscopic plant that can make its own food, and the other is a fungus, something like a mushroom, which is dependent on the alga for food, but which assists in forming a firm protective shell about the delicate algal bodies."

Dr. Lowe said that lichens, being self-contained food factories, are sufficiently hardy to survive on bare rocks.

"They attach themselves firmly to the bare rock by root-like structure," he explained. "By slowly disintegrating the rock beneath them, by catching dust from the air, and also soil particles that are washed to them, they accumulate and bind this elementary soil firmly beneath their living bodies and begin the formation of a soil layer on the once-naked rock.

"Curiously enough, in so doing they sign their own death warrant, for as soon as visible soil is accumulated beneath them, the pioneer crust lichens can no longer compete with the more vigorous reindeer lichens, and are crowded out. The reindeer lichens, in turn, are crowded out by the much more rapidly growing, drought-resisting mosses and low heaths. In such a succession of stages, forest lands come into being."

Lichens have sometimes played a life-saving role in those barren places where food is always critically scarce, Dr. Lowe pointed out. "'Rock tripe' has often been used by starving arctic explorers," he said.

According to Dr. Lowe, about 200 different kinds of lichens are common in northeastern United States, and an extended search would probably increase that number to a total of 500 or 600 species. He said that lichens occur everywhere—from the arctic regions to the tropics, from the highest mountain tops to the seashore, and from the driest of desert rocks to the beds of freshwater brooks. They form a large part of the plant growth on the treeless tundra of northern Canada, for instance.

All Flesh Is Grass

From a Diary of Travel in Georgia

By HAROLD MARTIN

Reprinted From The Atlanta Constitution

ELLIJAY, Jan. 12—After the meeting was over the little farmer in the old army blouse who had been standing in the back of the hall with a hand cupped to his ear came up to the speaker's platform to find the man from the TVA.

"I was in the back of the house," he said, "and my hearing ain't as good as it might be. I didn't git what you was driving at when you was talking about them bones. What was it you said when you held them up and talked about them?"

"I was talking about what limestone would do when you added it to the soil," said the man from the TVA. "I was using these bones to make my point."

He took the bones in his hands. "These bones, "he said, "are the shin bones from two beef steers that were fed on the same feed exactly, except one was fed on feed that came from land where limestone had been added to the soil.

"You will notice that I have got here a half a shin bone from each steer. You fit these bones together and it looks like they are two halves of the same shin bone. But you take them apart and look at the inside. You see that this bone here is twice as strong as the other bone. The walls of this bone are twice as thick. This bone is twice as heavy. The animal that this bone came from was a whole lot stouter, sturdied animal than the other one that was fed a feed that came from land that didn't have any limestone added to it."

"Well, I declare," said the little farmer, fingering the bones. "It shore does make a difference, don't it. I knowed that limestone made a difference in the crop. I proved that for myself. I put limestone on half of one of my fields and made twi'st as much hay as I made on the other half. I didn't know that it made the hay twi'st as nourishin' ".

"Lookahere," he said to the man from the TVA, "what about the meat? Feller eat the meat from this steer that had the limestone, wouldn't he get more nourishment out of it?"

"That's right," said the man from the TVA. "The minerals in the soil go into the crops the soil makes. They are passed on to the animals and the human beings who eat these crops."

"Figgerin' that way, then," the little farmer said, "if folks was gettin' what nourishment they needed from their food, they wouldn't need to buy all these pills and capsules and vitamin things then, would they?"

"That's right," said the TVA man. "There's more to the land than just the volume it will produce. Its produce must be rich in minerals, too. It's got to have quality . . . ."

Somebody interrupted the TVA man and the little farmer stood there, looking at the bones.

"That's what I tell these fellers who holler against all these alphabet agencies," he said, talking to nobody in particular. "There's more to farmin' than just stirrin' the soil and plantin' the seed and killin' the weeds and harvestin' the crops. There's things we don't understand."

"There are more things in heaven and earth, Horatio, than are dreamt of in your philosophy, huh?" I said.

"How's that?" he said.

"Nothing," I said. "I was just quoting a fellow who said the same thing you are saying in a little different way."

"I don't know about that. All I know is there's a whole lot to farmin' you can't learn in a field. You got to learn it in a laboratory or out of a book somewhere, and the farmer ain't got the time or the education to learn it for himself. Somebody has got to study it out for him and come tell him about it.

"And what I always says is this. If a feller knows a better way for me to do something, and he wants to tell me about it, and help me learn how to do for myself, I'm going to listen to him."

He started off and I asked him where he was going. He waved the bones, grinning.

"Over yonder where them fellers are," he said, "to slay a little more ignorance with the shin bone of this steer."

85 Years of Soil Depletion

A series of articles by the famous leader of The School of Living

Suffern, N. Y.

By RALPH BORSODI

Part 7

(Final Installment)

MOST of the crop land in the Eastern part of this country has been cultivated for nearly two hundred years. Much of this land has been tilled year after year without restoring the substances removed by the crops and has been depleted of nutritive elements and organic material vital to continued productivity. Many studies of the amount of stable manure required to maintain fertility in a good rotation (where no chemical fertilizer except lime is used), indicate that four tons of manure applied yearly to an acre of land is the minimum needed to maintain fair fertility and to produce average yields. (1) *Yet the total amount of stable manure now available for fertilization of the land, in addition to all the commercial fertilizers consumed on farms, is less than one-third of this amount.* On the average, therefore, we are extracting every year twice as much fertility from the land as we are returning to it.

Accurate statistics on crop land and on livestock producing manure are available for the past 85 years. Table 4 shows the combined amount of manure and chemical fertilizers applied to the land during this period. While the manure produced by all livestock on farms now amounts to one billion tons annually, only about a quarter or a third of the potential value of this manure is now realized. (2) Probably half of the total amount of manure produced by livestock is dropped in pastures and on uncultivated land. It is estimated that one-third to one-half of the remainder, handled as stable manure, is lost through failure to save the invaluable liquid manure and through loss of the nitrogen and other available nutrients by leaching and improper fermentation. Much damage to the fertilizer value of manure occurs in storage piles and on fields where most of soluble constituents are leached by heavy rainfalls or dried and scattered by the sun and wind.

If allowances are made for these losses, only about 350 million or 400 million tons of the total one billion tons of farm manure actually produced, is actually returned to the soil and used for crop land. As is shown in Table 4, the average amount of manure realized per year per acre of crop land, is only about one ton. When the commercial fertilizer consumed is converted into its manure equivalent and added to the stable manure consumed, the total amount of fertilizer (in terms of manure) used on farms amounts to only about one and one-quarter tons per acre each year. Since four tons are required to maintain a fair degree of fertility, the resulting deficiency amounts to something like two and three-quarter tons per acre per year. In the 85 years covered by this table, *the annual deficiency has accumulated until it now amounts to* 240 *tons per acre for every acre of cultivated land in the country,* and to over 86 billion tons for all the crop land put together. These figures are so stupendous that it is difficult to visualize their meaning.

((1). Based on unpublished data furnished by the Department of Crops and Soil, New Jersey Agricultural Experiment Station, and New York State College of Agriculture, and "Bio-Dynamic Farming and Gardening," p. 63.

(2). U. S. Yearbook of the Department of Agriculture, p. 445.

They indicate the extent to which we have robbed our soil in shipping agricultural produce to Europe and to the cities of the country.

Analysis of the organic and chemical substances of which our soil has been deprived in these 85 years through the failure to supply it the minimum requirement of manure and fertilizer as shown in Table 4, indicates that the depletion of plant nutrients on every acre cultivated now amounts to over 103,000 pounds —or about 50 tons—of organic substance; to 2,401 pounds of nitrogen, 1,200 pounds of phosphoric acid, 2,401 pounds of potash, 1,321 pounds of calcium oxide, 720 pounds of magnesium oxide, 960 pounds of sulphur trioxide, and correspondingly enormous quantities of the innumerable so-called secondary nutrients. The crop land of the United States as a whole has suffered to the extent of over 18½ billion tons of organic matter and many billions of tons of the various mineral and chemical substances necessary to maintain fertility at the level existing 85 years ago. This wholesale rape and robbery of the soil, of which most of the farmers who took part in it and who still take part in it, are unconscious, is a blistering indictment of the kind of education which they have received. They have been successfully taught by the food industries hungry to sell and process agricultural products; by the manufacturers of chemical fertilizers; by the agricultural colleges and the departments of agriculture of the various states and the nation, how to produce crops and extract fertility from the soil, but the record proves that these agencies have failed to teach them, (what every illiterate Chinese peasant learns), that they must return to the soil what they take out of it. It will, of course, take a gigantic effort at re-education to correct the mis-education of which not only the farmers of America but all the people of the country are the victims. But that these accumulated deficiencies could be gradually restored by teaching farmers the correct way to make an intensive and intelligent effort to preserve and use the available farm manure and vegetable wastes, is demonstrated by the record of the program of fertilization described in later sections of this Bulletin.

That there is ample authoritative confirmation for what has been said about manure wastage, is seen from the following paragraph in Year Book of the U. S. Department of Agriculture, "Soils and Men," (2)

"One billion tons of manure, the annual product of livestock on American farms, is capable of producing $3,000,000,000 worth of increase in crops. The potential value of this agricultural resource is three times that of the nation's wheat crop and equivalent to $440 for each of the country's 6,800,000 farm operators. The crop nutrients it contains would cost more than six times as much as was expended for commercial fertilizers in 1936. Its organic matter content is double the amount of soil humus annually destroyed in growing the nation's grain and cotton crops."

Further according to "Soils and Men," (2) these facts are evidence "that many farmers still do not understand the true nature of manure, the perishable character of its most valuable constituents, and the direct money loss incurred through its improper treatment." Those interested in agricultural education may well ask how it is possible that after the colossal sums spent for this purpose during the past century not only in great institutions but in field and extension work, American farmers should be ignorant of this elemental fact. It may be that the powerful industries which profit from this neglect of the farmer by selling him substitutes for what he could produce for himself, are exerting a malign influence upon American agricultural education. The indisputable fact is that in spite of the scientific education in which we take such pride, the average American farmer has learned less about this subject than the average Oriental peasant learns in the traditions handed down from father to son.

Yet the value of manure for maintaining and improving the productivity of the soil has been recognized from the earliest times. "Manure is of value in soil improvement," according to the U. S. Department of Agriculture (2) for three reasons, "because of its contents of fertilizer materials, of humus, and of certain organic constituents." Stable manure, which has been partly rotted or decomposed, as contrasted with fresh manure, is much more valuable according to Van Slyke (3) because of its value as (a) a source of plant food, (b) a source of organic matter, (c) a promoter of useful organisms, (d) a promoter of crop growth, (e) because of its long continued effects, (f) its conservation of soil fertility, (g) its commercial as well as agricultural value, (h) and because of the unbalanced character of fresh farm manures. In writing of the conservation value

(3). "Fertilizers and Crop Production," L. L. Van Slyke, former Chemist of the New York Agricultural Experiment Station.

of barn-manure Van Sluke says:

"When it is kept in mind that fifty per cent of the plant-food constituents of the food animals can be found in decomposed manure, it is readily appreciated that the crops raised on a farm and fed to the animals belonging to the same farm do not constitute such an exhausting drain on fertility as when crops are removed from the farm." (3)

In a recent book, Howard said:

"Although farm-yard manure has always been one of the principal means of replenishing soil losses, even now the methods by which this substance is prepared are nothing short of deplorable. The making of farm-yard manure is the weakest link in the agriculture of Western countries. For centuries this weakness has been the fundamental fault of Western farming, one completely overlooked by many observers and the great majority of investigators." (4)

Waksman emphasizes another aspect of the value of barnyard manure:

"The fact that small applications of farmyard manure exert a much more favorable effect upon plant growth than can be accounted for by its content of nutrients has been known for a long time; this specific effect was ascribed to the innoculation of the soil with the bacteria found abundantly in stable manure." (5)

In writing of the attempts made to determine the effect upon the health of livestock of the bacteria barn-manure puts into the soil, he states that instead of its having any ill-effects, that animals fed upon manured plots showed a greater resistance to disease, that grain raised upon plots fertilized with animal manure was found to be rich in vitamins, whereas that raised on plots receiving only artificial fertilizer was deficient in vitamins. Further studies had demonstrated that hay grown on soils receiving only chemical fertilizers is deficient in vitamin B, whereas that grown on manured soil contained this important vitamin. Hay from manured land not only curbed the development of deficiency symptoms in animals but was able also to cure symptoms appearing in animals previously fed hay grown on land to which no manure or organic matter was supplied.

The studies and experiments of these authorities and the practical evidence of centuries of farming, furnishes virtually irrefutable proof that only a balanced agriculture, in which animal as well as crop wastes are returned to the soil, can maintain soil fertility and continuous large crop yields. In spite of the existence of this evidence, most of the farmers of America today fertilize their land in accordance with methods developed to promote the sale of chemical and commercial fertilizers. Through failure to realize the value of farm animals and their waste products, they waste millions of tons of manure and many more millions of plants wastes which should be returned to the soil. Farming in this nation has been industrialized and specialized to such an extent that large regions are given over almost entirely to raising animals while millions of acres in other regions are farmed without any livestock to speak of at all. Millions of acres are tilled year after year for the production of grain and cotton without replacing the organic substances removed by these crops; equally large areas produce more manure than it seems possible for them to use and so dairy farmers are tempted to use it in a manner universally condemned as wasteful.

Other Forms of Soil Depletion

Authorities on the nature of the soil, its constituents, and factors governing fertility, are in general agreement that there are four principal ways by which soil becomes depleted of its nutrients:

(a) Plant growth and cropping is believed to remove from the soil the greatest amount of nutritive substances. Part of these substances are left in the soil in the form of stubble and roots, and this part is gradually transformed into new plant food. When crops are fed to animals on the farm and the manure carefully handled and returned to the soil on which the crops were grown, only a small portion of the nutrients is actually lost. When, however, the crop is sold and shipped from the farm, the amount of plant-food contained in the crop is almost a direct measure of the loss of plant nutrients and soil fertility.

(b) Leaching is another method by which soils are drained of plant-food in ever increasing amounts as the soil loses its original content of humus and organic material and so its ability to absorb and hold moisture. It is estimated that five billion tons of mineral matter *in solution* are carried each year by streams and rivers to the sea. Some of the most important plant-food constituents are lost by drainage as they are readily soluble in rain water. The most effective means of preventing this great loss is to keep the soil well sup-

(4). "An Agricultural Testament," Sir Albert Howard.

(5). "Humus Origin, Chemical Composition and Importance in Nature," Selman A. Waksman, Professor of Soil Microbiology, Rutgers University.

plied with humus. The solution-absorbing and holding power of humus is one of its most valuable functions. Another protective measure is continual plant growth by means of cover crops when crops are harvested. The soluble plant-food is used by the roots, and kept from draining away. Loss by leaching is greatly reduced if the land is never bare of vegetation.

(c). Erosion by wind and water is another factor which drains the soil of nutrients. Water running over the top of the soil carries with it soil particles which contain a large portion of the most available plant-foods in the soil. If chemical fertilizers are applied in increasing amounts, the humus and organic material in the soil are gradually reduced until the top soil becomes hard and resistant to moisture. The water then flows over the surface of the land causing sheet and gully erosion. Valuable top soil is also carried away by wind in semi-arid regions especially when it is bare of plant growth and deficient in moisture retaining humus and organic matter.

(d). Evaporation is a fourth way in which soil nutrients are lost. Nitrate nitrogen, and possibly ammonia nitrogen, are converted into a gaseous form and pass into the air when the soil is hot, dry and deficient in humus.

These four methods of soil depletion have been permitted and even encouraged in regions where most crops are sold from the farm and commercial fertilizers relied upon to continue the process of extracting humus from the soil. The devastated lands of the West, increasingly poor yields, and crop failures, are such startling evidence that something is wrong, that agricultural authorities at least are becoming conscious of the need of soil conservation.

It takes approximately four tons of manure yearly to maintain the original fertility of one acre of land used for the average farm crop. On this basis, in the 85 years between 1850 and 1935, the crop land of the United States has been robbed to the extent of more than 86 billion tons of organic materials. Each acre which has been continuously farmed during that period, has been depleted to the extent of 240.1 tons. Table 4 shows how far the total amount of both manure and chemical fertilizers used since 1850, falls short of replacing the fertility extracted from the soil by present day methods of farming.

TABLE 4

Year	Crop Land (1)	Manure From Livestock Yearly: Total Manure from Livestock (2)	Total Manure Realized (3)	Realized per acre	Commercial Fertilizer: Total Commercial Fertilizer (4)	Total in Manure Equivalents (5)	Manure Equivalent per acre	Total Realized per acre (6)	Accumulated Deficiency per acre (7)	Accumulated Deficiency All Crop Land
	(1,000 acres)	(1,000 tons)	(1,000 tons)	(tons)	(1,000 tons)	(1,000 tons)	(tons)	(tons)	(tons)	(1,000 tons)
1850	79,780	322,200	107,400	1.34				1.34	2.7	215,406
1860	122,351	402,000	134,000	1.08				1.08	30.7	3,756,176
1870	164,922	498,052	166,017	1.01				1.01	60.2	9,928,304
1880	207,493	640,604	213,535	1.03	1,150	12,328	.06	1.09	89.7	18,612,122
1890	250,064	939,085	313,028	1.24	1,950	21,684	.09	1.33	117.4	29,357,513
1900	292,636	980,771	326,924	1.12	2,200	24,816	.08	1.20	144.8	42,373,693
1910	337,787	1,069,088	356,363	1.06	5,453	63,909	.19	1.25	172.7	58,335,815
1920	355,169	1,245,724	415,241	1.17	7,177	79,808	.22	1.39	199.5	70,856,216
1925	357,567	1,124,122	374,707	1.05	7,334	93,875	.26	1.31	212.7	76,054,501
1926	360,443	1,078,516	359,505	1.00	7,329	96,743	.27	1.27	215.5	77,675,467
1927	363,319	1,061,850	353,950	.97	6,844	91,162	.25	1.22	218.2	79,276,206
1928	366,195	1,071,996	357,332	.98	7,986	108,609	.30	1.28	221.0	80,929,095
1929	369,071	1,071,579	357,193	.97	8,012	112,168	.30	1.27	223.7	82,561,183
1930	371,949	1,076,730	358,910	.96	8,222	117 081	.32	1.28	226.4	84,209,254
1931	369,420	1,088,354	362,785	.98	6,354	113,757	.31	1.29	229.1	84,634,122
1932	366,891	1,124,401	374,800	1.02	4,385	63,144	.17	1.19	231.9	85,082,023
1933	364,363	1,172,599	390,866	1.07	4,908	70,675	.19	1.26	234.7	85,515,996
1934	361,835	1,195,453	398,484	1.10	5,583	80,842	.22	1.32	237.4	85,899,629
1935	359,306	1,061,090	353,697	.98	6,274	91,349	.25	1.23	240.1	86,269,371

(1). Crop land harvested and crop failure as reported in Statistical Abstract of the U. S. 1938 for the years 1925, 1930, 1935. Crop land for 1850, 1900, 1920 estimated on the ratio of crop land to land available for crops in the years reported. Intervening years estimated on the basis of straight line trends.

(2). Compiled by the Fertilizer Research Division of the U. S. Bureau of chemistry and Soils, and published in the 1939 Yearbook of Commercial Fertilizers. These figures are based on the amount of manure produced by livestock on farms as reported for January 1st in the Yearbook of the U. S. Department of Agriculture.

(3). One-third of the total production as reported in previous column. According to the U. S. Department of Agriculture Yearbook for 1938, it is "safe to assume that only a quarter to a third of the potential value of the manure resources from farm stock of the country is realized now.

(4). Based on consumption of commercial fertilizers as reported in 1940 Commercial Fertilizer Yearbook.

(5) Based on the average plant-food content of mixed fertilizers consumed for years 1880 to 1935 as shown in "A Survey of Plant-Food Consumption in the United States in the year ended June 30, 1929."

(6). Total of manure realized per acre and commercial fertilizers in manure equivalents realized per acre.

(7). Four tons of manure per acre per year are considered the minimum required to maintain fair fertility according to unpublished estimates furnished to the School of Living by agricultural authorities of New York State College of Agriculture and New Jersey State College of Agriculture. A considerably larger application is needed to maintain good fertility.

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A Letter To The Times

Copy of a letter dated March 19, 1944 from Major O. G. S. Croft, Hephill, Near Hereford, to Mr. H. J. Massingham, Reddings, Long Crendon, Bucks, England.

I READ your letter in The Times of March 13th with much interest. I agree with every word of it. These Research Stations are in some ways a menace.

I expect you read a recent letter in the Sunday Times from Sir Albert Howard concerning Lord Hankey's article?

It is time that more of you who can speak with experience should make yourselves *heard* by these ridiculous people who govern our agriculture. Could not you approach Sir Albert Howard and jointly or individually get *The Times* to publish an article or articles (a letter is insufficient) pointing out the dangers; this, followed by a leading article might help to stop the rot.

What a pity, nay a tragedy—that our Minister of Agriculture does not consult and listen to a man of the stature of Sir Albert Howard, with his life time of research rather than to his present advisers, some of whom are clearly idealistic theorists labelled as experts.

Has the Minister of Agriculture shown any interest whatever in the excellent debate in the House of Lords initiated by Lord Teviot on October 26th 1943? Are the views of these very able men, who requested that a Royal Commission be set up to consider the whole matter, to be ignored altogether?

I have farmed my own land intensively for nearly 40 years growing such crops as hops, fruit of all sorts and managing my pastures for the production of live stock and milk. I am interested in large Estancias in Argentina, which country I have frequently visited and I can only say from a long and varied experience and I hope, with reasonable powers of observation, that "I cannot see any difference between composting gardens and composting fields". I also agree that the problem of fertility is a biological and not a chemical one. Few men of observation would disagree with such views.

I remember going in May 1939 to see a very large hop farm in Sussex, the property of a famous firm of brewers, when the manager told me that he even went to the expense and trouble of having the old hop line cut into short lengths by women in order that he could compost it with town refuse from Southwark: that was his main contribution to a greedy plant like the hop—and his average yield was a ton to the acre!

I agree with you again—town refuse and sewage sludge should be saved for the land (if possible put into paper sacks for quick and easy handling). Every thing should be composted: — look at the jungle, look at our woods and forests; are they poisoned with synthetic fertilizers? Nature fertilizes them and look at the results.

Scientists have done much for mankind — good and evil — but scientists are frequently specialists and there lies the danger.

I have used tar oil distillate washes on fruit trees in the winter over many years and seen the awful destruction of our friends the earthworms — and no doubt much bacteria; that these washes destroy the eggs of many harmful pests (and some friends) is true but they unbalance Nature and the *eventual* results on the soil bacteria may well prove disastrous.

The soil is a thing of life — destroy that life or even *reduce* it and disease steps in.

The Minister of Agriculture, Mr. Hudson has now discovered, according to the newspapers, that insufficient calves have been reared and is surprised!

Yet the permanent pastures which are the nurseries of our good pedigree herds have been ploughed up indiscriminately and are further threatened by the round-the-farm ploughing policy. Concerning this I wrote a letter to *The Times* last November which the Editor published and he gave it a leading article.

I was bombarded with letters from experienced men agreeing with my views as a whole and

do think this may have *helped* to stop the rot, although there is not *yet* any certainty about this, it wants following up.

We have Ministries of Health and Food. What are they doing? The first spends millions of money annually thereby increasing the sales of a well-known—and no doubt excellent stomach powder—and is going to spend more attempting to cure diseases, many of which should and could be prevented. Do we ever hear of preventative methods or preventative hospitals? I believe King Edward VII did once remind England about the necessity! The poor people of this country are largely denied fresh foodstuffs and are fed chiefly on tinned, cooked and interfered with ancient foodstuffs. (The artificial colouring of butter, now *allowed,* was discovered to be a menace to health. Every preservative is a menace. There is ample evidence that cooking utensils made of *aluminum* are a menace to health and a danger to milk, yet most milking machines are made of aluminum).

It is my belief that only a fertile land can produce a fertile and healthy people and that, so far as is possible, people should be fed from fresh foodstuffs from their own localities and that foodstuffs should never be preserved in *any way*—except naturally.

Perhaps you have read a paper by A. P. McDougall, read before the Farmer's Club, entitled "What of our Herds?" What indeed? If we want to regain our war losses, we must be quick off the mark, to renew our flocks and herds, especially our cattle. We hear a lot about breeding from good bulls but little about the cows. I have been a student of genealogy of man and beast. I have had much experience of the breeding of cattle and bloodstock here and in Argentina and I can say that in my view however important the sire is—and he is of the greatest importance — the mother is of *even greater importance.*

According to newspaper reports the Minister of Agriculture Mr. Hudson has just discovered, as has Lord De La Warr who, no doubt told him, that our live stock is not even so good as that of Canada! Most people who have travelled in countries like Argentina could have told him and his predecessors years ago—that as a *whole* our herds are a reproach compared to the fine herds you see throughout Argentina and other young countries. But when such a view was put forward it fell on deaf ears. I am well aware of the difficulties of Ministries and the fact that one could advocate destroying a large percentage of our cattle at one fell swoop, but the fact that so little has been done and is *being done* is and must be the fault of the Ministry of Agriculture.

Now we are going to indulge in artificial insemination. The dangers and abuses are obvious. Snapping our fingers at the laws of God: the *eventual* results must mean that Nature will protest in some way. To deprive animals of their natural functional desires must be wrong. I hope no breed society, worthy of its name, will touch this practice.

So we proceed. Everything in the name of science is to be artificial.

Unless this rot can be stopped, where will it all end?

Walnut Trees Are Poisonous

"Walnut trees are poisonous to other fruit trees, especially apples and pears." It is a fact that in the vicinity of walnut trees you will have difficulty in growing some plants. This apparently includes apples, some grains and tomatoes. However, it doesn't seem to interfere particularly with the majority of our ornamental plants. This is due to some toxic material given off by the roots of the walnut, and apparently from the husks or the fruit.—*Country Gentleman.*

The Dangers of Using Chemical Fertilizers

BY M. PEASE

Tomorrow (London, England) Jan. 1942.

IT is not so very long ago that this invaluable collection of weeds, household v e g e t a b l e w a s t e, grass-mowings, fallen leaves, etc., was called the "rubbish heap," or the "dump," and was relegated to some ignoble corner, was later usually burnt. Finally, wet and neglected ashes were often scattered, rather at random, among the vegetable plots to make room for the next collection.

But today one can hardly turn the pages of any gardening periodical without finding some reference to the "compost heap," its new and more worthy title. This is all to the good, but what is thoroughly *bad* is the almost inevitable advice offered to treat it with some one or another of the much advertised chemical specialities known as "accelerators." Most of these, I understand, do undoubtedly hasten the breaking down or decomposition of the heap, but one should realise that none of them *can create humus*. In face of the now universally acknowledged deterioration of the fertility of our soils, even to the stage of erosion, it is not merely a question of returning to the soil the humus which was previously there but of enabling these soils to develop their own humus.

Dr. Alexis Carrel in his world-famous book *Man the Unknown* wrote:

"Chemical fertilisers, by increasing the abundance of crops without replacing the exhausted elements of the soils, have contributed indirectly to change the nutritive value of our cereal grains and our vegetables."

I will also quote a remark made during the discussion after a lecture in London on "Soil Fertility and Nutrition" by Mr. F. C. R. Douglas, of which I have some notes. He said that:

"The abandonment to such a very large extent of the use of organic materials which not only maintain but increase the humus of the soil, and their substitution by artificial fertilisers, have had a very detrimental effect, though this may not be immediately evident, in comparing successive years with each other, in the end it is unmistakable."

Sir Albert Howard, one of the first pioneers of composting, speaking on the same occasion, said:

"Once practical examples of the effect of humus in the soil become increasingly available, all opposition and all arguments based on an elementary chemistry will cease to be advanced."

The old-fashioned farmer and gardener realised their responsibility to the soil much more fully than those of today. They loved the land they tilled because they contemplated it as they walked over the fields and, by the fireside in the evenings, they thought deeply on what they had learnt by close and practical observation. The small farmers of today are mostly modest and humble-minded men, and when the modern "smart Alec" turns up in a large car and recommends so much of this or another fertiliser to be scattered on his fields, he is overwhelmed by college-learned scientific talk, and perhaps remembers that he himself was taught in the village school.

I have myself seen the deep reluctance of the farm-labourers to scatter these so-called fertilisers on the fields, before administering which he is instructed to be careful to protect face and hands from their contact. I have even seen a bag of one of these precious chemicals on which was a prominent notice to say that the applicant must wear a gas-mask when applying it. I do not know whether this particular admixture is still advertised!

I also well remember some years ago attending a lecture by Sir Albert Howard at which that great scientist, Professor Armstrong, was in the chair, and how he suddenly put down his galley-proof opening address and said:

"The science of the last forty years has been blind of one eye. It has looked only at the growing plant, and not at the decaying plant."

This was really a most remarkable saying from the man who had created the Laws Committee, which under his guidance was the first body of scientists to experiment with the application to plant growth of the chemical wastes from industrial processes, and later the Founder of the Rothamsted Experimental Station.

I could quote many other statements on similar lines which indicate quite clearly the increasing number of people now gazing with wide open eyes, and with some amazement, at the growing number of farmers, market and private gardeners who have acquired the compost-habit.

Not long ago when I was taking some visitors round the Bray gardens, I said: "I have still to find a good gardener who, having once acquired a real compost-habit, would ever give it up." I did not, at the time, know that my own head-gardener, who was short of stature, was present but completely hidden by my taller guests. But one of them turned to him and said: "What about you? Would you give it up?" and the little man replied: "Not till I gives up gardening altogether!"

Some people are afraid that the carefully made compost-heap means a lot of extra work. This is not so, for it does not take many more minutes to wheel a load of weeds, etc., to a suitable place and place it in level layers, and lightly tread it down, than chucking it all out in a shapeless mass in some ignoble corner. The *Spectator* has recently published some interesting comments on the now many and varied compost systems. The writer of these notes most charmingly confesses that his own system nevertheless remains that of the "dump" on to which he throws all available waste products and, in his own words, "leaves it unattended, unturned, and certainly unblessed." Even so, he grows very fine crops, but I would like to know with what permanent effects on the nature of the soil?

How to Build the Compost Heap

Last month and this month are just the time of the year when ample material is at hand, for we can make good use of all the plants now cut back in the flower borders, in addition to the available leaves, etc., from the vegetable garden and all fallen leaves. Begin by marking out some handy space with four pegs, and build up the heap in an oblong shape with gently sloping sides. A good size is about 6 ft. by 3 ft., and carry on till it is 4-5 ft. high. It will shrink considerably. Household scraps from the kitchen can be included. Tread down now and again when building, but not too hard, just enough to keep it firm and shapely.

If you can get any unslaked lime, a very light sprinkling of it about every 18 in. to 2 ft. is good. Do not leave it exposed, but cover with some fresh material, or an inch or so of soil. We have had to omit this, as no unslaked lime is available. It is best not to make your heap in *full sun* but where it is shaded for part of the day. This prevents it drying out too rapidly.

I may perhaps add that we had here to deal with a very poor sand and gravel soil, but now after some years we have an almost perfect humus soil of a depth of 2½-3 feet.

Using the Compost

The usual practice in the gardens is to top dress all flower borders and rose-beds every spring, just lightly forking it in. Compost should never be dug in deeply. In the vegetable garden the soil is composted before planting or sowing. It can be finely sieved with ordinary potting soil for all seed boxes, etc.

When I came here the vegetable garden was most neatly, almost mathematically, divided into equal plots. Every year these are either composted or treated with cow manure; in the following year the treatment is reversed, and those manured the previous year are composted, and vice-versa. Cropping is then planned according to the requirement of the plants to be grown in them.

In conclusion, I hope that all readers of TOMORROW will not put off till tomorrow before they start a compost heap, but immediately acquire the "compost habit."

Under present conditions, if we are using chemical fertilisers and poisonous sprays we are *at war* with the soil, and we have only ourselves to blame if we find increasing trouble in our gardens from pests and diseases. Let us all "change our hearts," and in the noble words of the late Alma Baker in his old age, no longer be "at war" but at Peace with the Soil.

NOTE of Editor of Organic Gardening:—We recommend hydrated lime.

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Reader's Correspondence

Please write on one side only. Do not make your letters too long. Put each different query on a separate sheet. Send stamped, self-addressed envelope for reply.

LEAVES

Organic Gardening:

I have oceans of Oak Leaves. Are these beneficial or harmful because of acidity?

H. A. Bishop,
Wellesley Hills, Mass.

Answer

Dear Mr. Bishop:

Leaves, including Oak, are a wonderful thing for your garden if they are decayed. Of course, they could also be used as a mulch between the rows of plants without decaying them. When they become decayed, they are somewhat acid so that it would be advisable to put some lime with them. The best way to handle leaves is to include some with the green matter in a compost heap. In the six inch section of green matter, use about five and a half inches of weeds and ordinary grass clippings and also a very thin layer of leaves so that it will not stop the aeration of the heap because of the tendency of leaves to pack.

A professor of a prominent Agricultural university recently wrote me that he used tons of leaves but never took them from city gutters, because it may become contaminated there with asphalt oils used in conditioning city streets.

This brings up the question of leaves picked up along country lanes, many of these are from fruit and other trees that have been sprayed with strong arsenate preparations. Such leaves will not only resist decay but will introduce objectionable elements into the soil. These leaves contain splotches of the spray that can easily be seen when green.

●

COMPOST—LUMPY

Gentlemen:

The three month period for my compost heap has just terminated. The material looks good but is lumpy here and there. What do you recommend?

James Wilson,
Emporia, Kansas.

Answer

Dear Mr. Wilson:

We had this trouble ourselves recently, what we did was to make a box similar to one for mixing cement, called a mortar box. The sides are about 10 to 12 inches high, the bottom about 3 or 4 feet square. We dumped the finished compost in it and worked it thoroughly with a mortar-mixing hoe. This will break up the lumps and shred it nicely for quicker absorption in the soil.

In farming operations this is not necessary as the action of the rotating mechanism of a manure spreader will more or less break it up. For gardening this shredding of the compost in almost all cases is to be highly recommended.

TREES—WALNUT

Dear Mr. Rodale:

In planning a vegetable garden location should we keep away from trees?

J. B. Morey,
Phila., Pa.

Answer

Dear Mr. Morey:

It is best to keep away from trees because their roots will compete with the vegetable roots for nourishment. It is especially important to stay away from walnut trees as the roots of the latter are said to give off a toxic emanation.

●

POTASH

Is there a natural form of potash that is untreated with injurious chemicals. Isn't the concentrated lye you buy in cans, a pure potash that could be diluted and added to the soil with much the same effect as the potash in ashes?

M. G. Carpenter,
Panama City, Fla.

Answer

Dear Mr. Carpenter:

Regarding the natural form of potash, the best you can find is ordinary green matter, such as weeds, leaves, grass clippings, etc. This is very rich in potash. If you make compost by the Sir Albert Howard method and use plenty of green matter, you will be well taken care of for this element. Wood ashes, if used instead of lime in the compost heap, is very rich in potash.

We would not use lye, as it is much too strong and concentrated and would be detrimental to the biologic life of the soil. It actually burns.

I do not think your strawberries results were due to a shortage of phosphate and potash. There probably are other causes and I am sure that as you enrich your soil organically, this condition will be remedied. It may be possible that a soil that is so rich in peat as you mention, might be too rich for strawberries.

I would not use the chicken manure without making it into compost and would rather wait until you could do so instead of mixing it with your regular compost.

●

BARK

Gentlemen:

The soil in this part of Florida is sandy with very little top soil.

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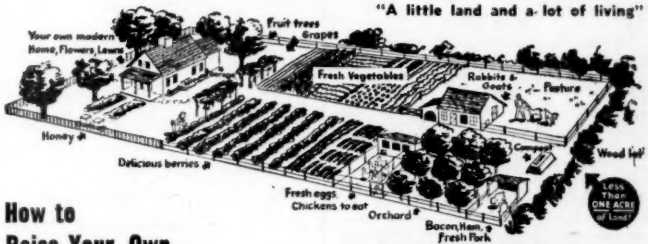

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Until I became interested in your methods of organic gardening I have been digging trenches across my garden and filling them with layers of leaves—bark, etc.—Some horse manure and lime—along with sand gained by digging the next trench.

Results have been fair—in that some things will grow whereas nothing would grow in areas not treated this way. However, since the material I have put in the trenches does not decompose very rapidly, I believe that all I have gained is a little better moisture holding quality in the sand.

After a heavy rain the water disappears almost instantly, and gardens must be watched continually. I notice more moisture retained in areas I have treated as above.

We have unlimited supply of *pine bark* from a local pulp mill and a good source of oak leaves. *Would the bark make good compost?* Would it be desirable to invent a method of pulverizing the bark if it is suitable? Some of the bark has stood for 6 or 7 years in a pile 4 to 6 feet deep and seems to be partly decayed. Would this bark be better than bark fresh from the log?

Would it be good sense to use bark under the soil to hold moisture and then work compost in the top soil over the bark?

Barn yard manure is hard to get here but fish scraps are available. Are they O. K.?

S. L. Mathews,
Fernandina, Fla.

Answer

Dear Mr. Mathews:

I have noted your method of making trenches but I believe you would get better results by making compost of the material. You could still have the trenches for trapping water and merely put green matter in the trenches, but if you had any manure, that should be composted together with green matter.

The pine bark, that you mention, would be the equivalent of sawdust or wood shavings provided it is pulverized in some way. If you used it without breaking it up fine, it would be very resistant to decay.

There is an expensive piece of equipment called a bog machine which sells for over a thousand dollars and is not now available which would make a very fine saw dust-like material or even finer of this bark. The Park System of the city of Miami has one and uses it for breaking down palm fronds. They then use this broken down material as a bedding for cows and it is later composted. There is no doubt that partially decayed bark would be better and decay more readily than new bark.

I would not use the bark in the soil in the manner you suggest because it will interfere with the bacterial activities in connection with growing crops unless you would put it in a place where you would not grow crops for a few years.

●

CANAL MUD

Dear Sirs:

I have read and re-read your booklet "Compost" and appreciate the information; *but didn't see anything about using old partially rotted leaves and vegetation (from canals) in making compost. Would you use thinner layers of such material and more manure (as of course* would result if one used the same thickness of manure layers)? Or could you use such partially rotted material in the same manner

as the withered green material? Or mix them?

Miss Ethel V. Smith,
Lake Hamilton, Fla.

Answer

Dear Miss Smith:

Enclosed herewith is the article on sunflower seeds. The old rotted material, consisting of leaves and vegetation representing a residue in canals, could be used but trouble is usually experienced with such material when it is put directly on the land. I have recently seen a very interesting application of this common mistake in which an old mill, which has water power, usually cleans out the race every few years. The race consists of that part of the flowing brook which leads into the mill; the water flowing into it from year to year brings a sediment which gradually clogs up this section, which is called the race, so every once in a while it must be cleaned out.

The mill owner told me that the last time they had to clean it, some farmer used this sediment as a fertilizer, putting it directly on to the land. As a result, there was a very poor result on their crops that year. In the second year, however, the land was benefitted by this residue material and the crops were exceptionally good. This is the same trouble that is usually experienced in using raw manure or in plowing under a green manure crop. The soil bacteria and fungi, in breaking down this raw material, used too much of the nitrogen in the soil as their energy producing food, thus leaving insufficient nitrogen for the new crop that has to grow. When these bacteria die, their nitrogen enriched bodies help the soil, which benefits the next crop.

The overflow of the Nile River in Egypt contains a very fine sediment which flows on the land each year and which makes it so rich that practically no other fertilizers are needed and marvelous crops are obtained, but in this case, this sediment is very fine.

The Chinese are adept at using canal mud, but they have centuries of experience in handling it and making compost with it first.

It is best to first pile this material from canals in flat heaps that are not over 6 or 7 inches high and permit it to become aerated. Then small amounts of it could be included in your compost heap, perhaps not over 10 or 15% of each heap. You could use slightly less manure and substitute some of this.

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ORCHARDS—PEACH BORERS

Dear Sir:

I notice the letter by F. L. Suttles about peach borers.

A friend of mine once told me that he had once raised lots of Alberta peaches and the way he fought peach borers was to pile 4 or 5 inches of soil up around the tree trunk in August and remove it after cold weather set in.

He claimed that the eggs were laid along in the last part of August and the first part of September, just below the surface of the earth in tree trunk and that by removing the dirt that the eggs would be frozen out before Spring.

Adam Williams,
Jeffersontown, N. Y.

●

POTATOES—GREEN

Gentlemen:

Would like to know what the cause is that makes so many potatoes that we buy on the market green under the skin and which tastes bitter.

S. de S. Calkins,
Los Angeles, Calif.

Answer

Dear Mr. Calkins:

Some times potatoes will show green on and under the skin which is due to the earth coming away from the potatoes and the sun shining on it during the growing processes. Such potatoes should not be eaten.

●

CHICKEN DROPPINGS

My Dear Sirs:

I am able to buy chicken droppings that are not mixed with any sort of inorganic materials; that is, droppings just as they are when they are scooped up from the boards on which they fall. Please tell me whether these droppings should be used in a way different to cow or horse manure (which is difficult to obtain here); whether they are more or less potent than manure; whether they make compost as quickly: whether more water should be applied to the compost while composting, and any other information you will give about the use of chicken droppings in making compost and as use for fertilizing.

Julia St. John,
Miami, Florida.

Answer

Dear Miss St. John:

Sir Albert Howard's process for making compost is based on using two inches of manure to every six inches of green matter, where the manure is mixed with straw or other bedding, but since the chicken droppings that you mention do not have any bedding, I would suggest that you use much less to every six inches of green matter. I would not use over one inch of the chicken droppings. I believe you would get better compost also if you mixed this manure with the green matter thoroughly. This would give you in the compost heap your green matter mixed with the pure chicken manure, a one-eighth inch layer of earth with a sprinkling of lime, with the process repeated over again. Where manure is thus mixed with the green matter, it eliminates one of the turns in the compost heap. You would then turn the heap after about six or seven weeks.

The water requirements would be the same as for an ordinary heap, that is you must maintain the consistency of a pressed out sponge, otherwise I do not know of any special differences of this material over others.

COMPOST—FOR POTATOES

Gentlemen:

How can you use compost for growing potatoes since you can't use either manure or lime on potatoes.

Miss F. J. Peticolas,
Simsbury, Conn.

Answer

Dear Miss Peticolas:

You have been misinformed when you state that manure should not be used for potatoes. Raw manure may not be used, but exceptionally well-rotted material would be satisfactory. The potato is a crop that requires very little fertilizing and also neutral to acid soil. It would be best to make a separate compost heap for this purpose, eliminating the lime. Peat humus would be good because it is acid.

●

EARTHWORMS — COMPOST MANUFACTURE

Dear Mr. Rodale:

Concerning all this argument pro and con concerning compost, this and other, *would it not be just as good to stack or put the manure in boxes or pits and use earthworms to eat it up and convert it into worm castings?*

Would these worm castings be as rich in plant food or rather bacteria food as compost formed by the Indore method?

I know such a method would not be as practical on a large scale as the Indore compost method, but I'm not wondering if the final result would be about the same in the soil?

J. C. Stephens,
Tyler, Tex.

Answer

Dear Mr. Stephens:

Thank you very much for your letter of October 11th. The Ohio Earthworm Farms do make some compost by means of earthworms. They have to use a tremendous number of worms. In that case the material must not be piled up in layers as advocated in the Sir Albert Howard Method of making compost. In other words, everything must be done to see that the usual heating up of the compost does not take place. In that event it would kill or drive away the earthworms.

It is for that reason in the ordinary compost heap that the earthworms are driven off as soon as the heat of fermentation rises. They come back from the ground later on. We believe that the ordinary method of making compost is simpler. You will find also that the use of boxes for the inclusion of earthworms in the compost means a great deal of work. This would be less by doing it in pits. We do not know of any work that has been done to compare the value of earthworm castings with compost itself. They are both extremely rich.

This method may be applicable to the small gardener. In fact, I have tried it myself.

I took a box about 3 feet high and placed at the bottom of it about an inch of earthworms taken from a regular earthworm breeding box. I then filled the rest of the space in the box with the regular ingredients of a compost heap, namely, manure, green matter, earth and lime. In about five months the worms had worked this material down to a fine compost. One advantage of this method is that you can make compost during the winter time in a heated cellar.

SULPHUR

Dear Sir:

Please inform me if ground sulphur is permissible for certain types of soil, and what type?

Chas. J. Berg,
Berkeley, Calif.

Answer

Dear Mr. Berg:

Replying to your letter of September 14th, sulphur in any form should never be used on the soil or on the plants. This is a rule regarding which there should never be any exception. Sulphur is one of the strongest materials available and is very detrimental to many beneficial micro-organisms.

●

HOT BEDS

Dear Sir:

Can you tell me how to keep the dirt for hot beds up to par without getting new soil each year?

Florence E. Ades,
Falmouth, Ind.

Answer

Dear Miss Ades:

Our method of making compost will very nicely build up the fertility of the soil in your hot beds so you will not have to change them each year.

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